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Removal of natural organic matter from aqueous solutions by electrocoagulation

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Original Article

Abstract

Natural organic matter (NOM) affects some qualitative parameters of water such as color. In addition, it can deteriorate the performance of water treatment process including coagulation, adsorption, and membranes. NOM also reacts with chlorine in the chlorination process and may form disinfection by-products. The present study was carried out in laboratory-scale in a batch system using a cylinder shape reactor with effective volume of 2 l. The initial NOM concentrations during the study period were 10, 25, and 50 mg/l. After specific time intervals, samples were taken from the reactor and filtered. Finally, the NOM removal according to total organic carbon (TOC) content of the samples that were analyzed with a TOC analyzer. The results showed that the highest NOM removal efficiency for three initial concentrations 10, 25, and 50 mg/l were 91, 94, and 82%, respectively. These removal efficiencies were obtained at pH 7, contact time of 20 min, and electrical current of 0.1 A. The electrical energy consumption was 0.08, 0.06, and 0.03 kWh/m^3, respectively. In this study, the application of electrocoagulation (EC) treatment method using combined Al and Fe electrode was examined to remove NOM from aqueous solution. Based on the obtained results, the EC can be used as an effective method for removing NOM from aqueous solution.

KEYWORDS: Electrocoagulation, Natural Organic Matter, Bipolar and Monopolar, Aluminum, Iron

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Introduction

In recent decades, due to the sever pollution of water resources such as rivers, seas, and reservoirs by wastewater from domestic, industrial, and agricultural sources, the concentration of water contaminants has increased dramatically. Among water pollutants, organic pollutants are important due to their high quantities and ranges in water resources, an elevated concentration, specific properties, and incomplete removal by conventional water treatment plants.[1]

Natural organic matter (NOM) is a complex mixture of different organic compounds originating from both natural and anthropogenic sources and is present in all water bodies. Naturally available organic compounds provide the possibility of formation of new organic compounds in water treatment plant or distribution system due to their high reactivity.[2]

The presence of NOM not only affects some water quality parameters such as color,[3] but also interferes with the performance of treatment

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